

REMARKS

Reconsideration and allowance are respectfully requested.

Claims 1-2, 4-6 and 8-11 are pending. Applicants affirm the election of Group I (claims 1-11) in response to the Examiner's restriction requirement. Non-elected claims 12-23 were withdrawn from consideration by the Examiner. Applicants have canceled the non-elected claims without prejudice to future prosecution of that subject matter.

The amendments are fully supported by the original disclosure and, thus, no new matter is added by their entry. The description of "solid matrix" in claim 3 is incorporated into claims 1-2; similarly, the description of "functionalizing agent" in claim 7 is incorporated into claim 2. Support for L_x as a phosphine ligand is found in Formula II. The exterior and interior surfaces of the solid matrix are indicated in Formula I. Informalities in the phrase "a N-donor and O group" are corrected. In the claims, the term "between" is replaced by a range expressed --from-- and --to-- that includes the value at either end. The terms R_1 , R_2 , and R_3 are now consistently recited in the claims with subscripts; similarly, the term "Formula" is now consistently capitalized in the claims. There were two variables n recited in the formulae of the claims, there are now denoted n and m for clarity. In the claims, Markush groups contain the standard terminology of --selected from the group consisting of--.

35 U.S.C. 112 – Enablement

Claims 2-11 were rejected under Section 112, first paragraph, because it was alleged that they contain "subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention." Applicants traverse because a description of how only exterior sites can be blocked is found at page 9, second paragraph, of the specification. The methods are also illustrated in the nonlimiting examples.

Withdrawal of the enablement rejection made under Section 112, first paragraph, is requested because it would not require undue experimentation for a person of skill in the art to make and use the claimed invention.

35 U.S.C. 112 – Definiteness

Claims 1-11 were rejected under Section 112, second paragraph, as being allegedly "indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention." Applicants traverse.

In the claims, the solid matrix is described as a microporous or a mesoporous material. It is the only solid described in claims 1-2 and a portion is illustrated in Formula I, showing exterior and interior surfaces. The two oxygen atoms have dangling valences and the third oxygen atom is actually bonded to the interior surface of the solid matrix. In Formula I, M is a Group VIII metal, L_x is a phosphorous ligand, and ML_x is an organometallic complex. The solid matrix may be blocked with the agent described at page 5, last paragraph, of the specification and then may be functionalized with the agent described at page 6, second paragraph, of the specification. The functionalized matrix is treated with a metal complex solution with a Group VIII metal and a semilabile anionic ligand, which is a chelating organic compound containing an N donor and an O^- group as in Formula II. In accordance with the foregoing, Applicants submit that their description in the claims of an immobilized metal complex catalyst is clear and definite. Moreover, the Examiner is respectfully asked to consider the attached U.S. Patent 6,069,253 that is cited in the present specification, inter alia, at page 6, lines 12-13, and page 9, lines 9-15. The terms objected to in the pending Office Action to describe the metal complex catalyst are understood in the art as shown by their usage in the specification and claims of U.S. Patent 6,069,253. The term "cycloaromatic" is also retained because its definition is known in the art (see U.S. Patent Publication 2005/0113622).

In claim 2, the term "unperturbed" is replaced. Reference is made to U.S. Patent 6,069,253 with regard to Formula II. As previously explained, M is a Group VIII metal, L_x is a phosphorous ligand, and ML_x is an organometallic complex.

Claim 3 is canceled, but a limitation of the solid matrix is incorporated into claims 1-2. Claim 7 is similarly canceled, but a limitation of the functionalizing agent is incorporated into claim 2.

The terms "purely" and "etc." are deleted from claims 4 and 5, respectively, as the limitations are not required for patentability. Other informalities in claims 4-6, 8 and 10-11 are corrected, some as suggested by the Examiner.

Applicants request withdrawal of the Section 112, second paragraph, rejection because the pending claims are clear and definite.

35 U.S.C. 103 – Nonobviousness

To establish a case of prima facie obviousness, all of the claim limitations must be taught or suggested by the prior art. See M.P.E.P. § 2143.03. Obviousness can only be established by combining or modifying the prior art teachings to produce the claimed invention if there is some teaching, suggestion, or motivation to do so found in either the references themselves or in the knowledge generally available to a person of ordinary skill in the art. See, e.g., *In re Fine*, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988); *In re Jones*, 21 USPQ2d 1941, 1943-44 (Fed. Cir. 1992). It is well established that the mere fact that references can be combined does not render the resultant combination obvious unless the desirability of that combination is also taught or suggested by the prior art. See *In re Mills*, 16 USPQ2d 1430, 1432 (Fed. Cir. 1990). Thus, even if all elements of the claimed invention were known, this is not sufficient by itself to establish a prima facie case of obviousness without some evidence that one would have been motivated to combine those teachings in the manner proposed by the Examiner. See *Ex parte Levengood*, 28 USPQ2d 1300, 1302 (B.P.A.I. 1993).

Evidence of the teaching, suggestion or motivation to combine or to modify references may come explicitly from statements in the prior art, the knowledge of a person of ordinary skill in the art or the nature of the problem to be solved, or may be implicit from the prior art as a whole rather than expressly stated in a reference. See *In re Dembiczak*, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999); *In re Kotzab*, 55 USPQ2d 1313, 1316-17 (Fed. Cir. 2000). Rigorous application of this requirement is the best defense against the subtle, but powerful, attraction of an obviousness analysis based on hindsight. See *Dembiczak* at 1617. Whether shown explicitly or implicitly, however,

broad conclusory statements standing alone are not evidence because the showing must be clear and particular. See *id.*

Finally, a determination of *prima facie* obviousness requires a reasonable expectation of success. See *In re Rinehart*, 189 USPQ 143, 148 (C.C.P.A. 1976).

Claims 1-11 were rejected under Section 103(a) as allegedly unpatentable over U.S. Patent 6,251,280 ("Dai"). Applicants traverse.

Applicants' invention is directed to an immobilized metal complex catalyst bound to the interior surface of a mesoporous or microporous support as recited in the product claim 1 and the method claim 2.

Dai discloses an ordered mesoporous sorbent comprising a substance such as silica, titanium or zirconium with a uniform pore size distribution. Dai focuses only on the use of a mesoporous substrate with a uniform pore size distribution with ordered hexagonally packed pores on the surface thereof. Dai refers to the bonding that is achieved between the substrate and the ligand on pores present on the exterior surface of the support (col. 5, line 63, to col. 6, line 24). Moreover, there is no teaching or suggestion therein that the Dai method is applicable or would have a reasonable expectation of success across the wide range of mesoporous and microporous substrates available in the art.

The Examiner himself acknowledges that Dai does not teach that transition metal compounds are bound to the amino functionalized surface tethering group in an organometallic complex. Thus, in order to arrive at Applicants' claimed invention, one of ordinary skill in the art would have to have concluded: that what works for mesoporous silica, titanium or zirconium supports with ordered hexagonally packed pores on the exterior surface would work as well across the whole range of mesoporous and microporous supports known in the art; that the Dai disclosure of binding a metal compound to an amino functionalized surface tethering group would apply to transition metals, notwithstanding the wide range of metals that can be bound; and that what works for the exterior surface would apply for binding to an interior surface of the substrate as well. Furthermore, there is no evidence presented that one of ordinary skill in the art would have been motivated to use an organometallic catalyst in the Dai method to immobilize

the catalyst on the interior surface of the support. Applicants submit that the Dai disclosure is insufficient to teach or suggest the use of a blocking agent to block the exterior surface of a mesoporous or microporous substrate such that only the active sites on the interior surface are functionalized and are available for bonding to a transition metal complex such as Formula II.

Furthermore, the Dai catalyst is used for the removal of toxic metals from waste streams and mining effluents, and the detection and removal of harmful chemicals from samples (cols. 6 and 7). In other words, the Dai catalyst has a very specific application that is unrelated to the present invention. There is no teaching or suggestion in Dai towards the use of such catalysts for carbonylation reactions such as those disclosed in the present invention.

Claims 1-11 were rejected under Section 103(a) as allegedly unpatentable over JP-1085141 ("JP"). Applicants traverse.

Applicants' invention is directed to an immobilized metal complex catalyst bound to the interior surface of a mesoporous or microporous support as recited in the product claim 1 and the method claim 2.

JP discloses a noble metal catalyst, and describes reacting silica with an amine having siloxy groups at the other end of the methylene chain followed by reducing the noble metal carrying silica. There is no disclosure therein of the use of an organometallic catalyst or the use of blocking of exterior sites using a blocking agent and making only active sites on the interior surface available on a support. Specifically, JP does not teach or suggest the binding of an organometallic complex catalyst to a mesoporous or microporous support on the interior surface of the support. It is silent regarding use of a blocking agent to block the exterior surface of a mesoporous or microporous substrate such that only the active sites on the interior surface are functionalized and are available for bonding to an organometallic complex. The nature of the support silica for the noble metal is also not given. There is no teaching or suggestion therein towards mesoporous or microporous supports. Thus, in order to arrive at Applicants' claimed invention, one of ordinary skill in the art would have to have concluded: that the fixing of a noble metal on the surface of a granular silica using a silane having an amino group

would also work for as well across the whole range of mesoporous and microporous supports known in the art; that the teaching therein of binding a noble metal compound being fixed to the surface would also apply for all metals including all transition metals, notwithstanding the wide range of metals that can be bound; and that what works for the exterior surface would apply for binding to an interior surface of the substrate as well. Applicants submit that the JP disclosure is insufficient to teach or suggest the use of a blocking agent to block the exterior surface of a mesoporous or microporous substrate such that only the active sites on the interior surface are functionalized and are available for bonding to an organometallic complex.

In particular, JP states in the abstract, "The catalyst . . . carries noble metal on the surface of silica and thickness of the carrying layer can be controlled." This again clearly indicates that the metal compound is immobilized on the exterior surface of the silica support. Applicants also note that the Examiner alleges that the use of blocking agents to direct reactivity away from a particular site is conventional. But absent some evidence in support of this allegation, Applicants believe that JP does not render obvious the present invention. There is no evidence presented that one of ordinary skill in the art would have been motivated to use an organometallic catalyst in the JP method to immobilize the catalyst on the interior surface of the support.

Claims 1-11 were rejected under Section 103(a) as allegedly unpatentable over U.S. Patent 4,394,294 ("Gryaznov"). Applicants traverse.

Applicants' invention is directed to an immobilized metal complex catalyst bound to the interior surface of a mesoporous or microporous support as recited in the product claim 1 and the method claim 2.

Gryaznov discloses a catalyst intended for hydrogenation of organic compounds. The catalyst is a hydrogenation membrane catalyst comprising a sintered powder metal substrate with film produced by interacting a polyorganosiloxane polymer and a heterogenized palladium complex deposited thereon. There is no teaching or suggestion in Gryaznov towards a catalyst useful in carbonylation reactions. In addition, the Gryaznov catalyst comprises a film deposited on a porous metallic substrate. There is also no teaching or suggestion towards the use of a mesoporous or microporous substrate

where the active sites on the exterior surface of the substrate are blocked and the organometallic complex bound to the interior surface of the substrate. Thus, there is no evidence presented that one of ordinary skill in the art would have been motivated to use an organometallic catalyst in the Gryaznov method to immobilize the catalyst on the interior surface of the support.

Claims 1-11 were rejected under Section 103(a) as allegedly unpatentable over *Heterogenous Catalysts and Fine Chemicals III*, Guisnet et al. (eds.), Elsevier 1993, pp. 107-114 ("Pugin"). Applicants traverse.

Applicants' invention is directed to an immobilized metal complex catalyst bound to the interior surface of a mesoporous or microporous support as recited in the product claim 1 and the method claim 2.

Pugin discloses various homogeneous silica gel catalysts which are useful in the enantioselective hydrogenation of methylacetamidecinnamate. There is no teaching or suggestion therein of using a heterogeneous catalyst, the binding of a metal complex to the interior surface of a substrate after the blocking of active sites on the exterior surface, or the use of mesoporous or microporous substrates - resulting in a catalyst useful in carbonylation. Furthermore, there is no evidence presented that one of ordinary skill in the art would have been motivated to use an organometallic catalyst in the Pugin method to immobilize the catalyst on the interior surface of the support.

In summary, the cited references do not disclose an organometallic catalyst that is immobilized on the interior surface of a solid matrix and may be used for a process of carbonylation of an aryl olefin or an alcohol. Only a single reference is cited in each rejection and no evidence was made of record in the Office Action that one of ordinary skill in the art would have been motivated, at the time the present invention was made, to make the modifications in the reference's disclosure or that there was a reasonable expectation of success in making such modifications.

Withdrawal of the Section 103 rejections is requested because the invention as claimed would not have been obvious to a person of ordinary skill in the art at the time it was made.

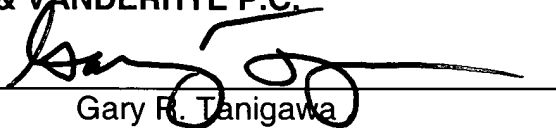
Conclusion

Having fully responded to all of the pending objections and rejections contained in this Office Action, Applicants submit that the claims are in condition for allowance and earnestly solicit an early Notice to that effect. The Examiner is invited to contact the undersigned if any further information is required.

Respectfully submitted,

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